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ABSTRACT

The workbook is intended to provide personnel having responsibility for bicycle investigations or inspections with an overview and technical information on bicycles which will serve as a technical foundation for understanding the bicycle regulations. It discusses bicycles in general, and introduces the user to the specific parts of bicycles. On completion of the workbook participants should be able to complete the following objectives: (1) define the different types of bicycles, including their distinguishing features; (2) identify the factors that contribute to bicycle accidents; (3) identify the five major systems of bicycles; and (4) locate and describe specific parts of bicycles. Part 1 (12 pages) discusses briefly the history of bicycles, types of bicycles, the bicycle market, and bicycle accidents. Part 2 (41 pages) discusses in detail the various parts of the bicycle: seat, steering system, frame system, wheel system, drive system, and brake systems (coaster or pedal-operated brakes and caliper or hand-operated brakes). Exercises and answer keys accompany each section. Detailed illustrations and diagrams are found throughout the document. The document concludes with three appendixes: bicycle illustrations for different types of bicycles, glossary of bicycle terms, and a bibliography. (Author/BP)

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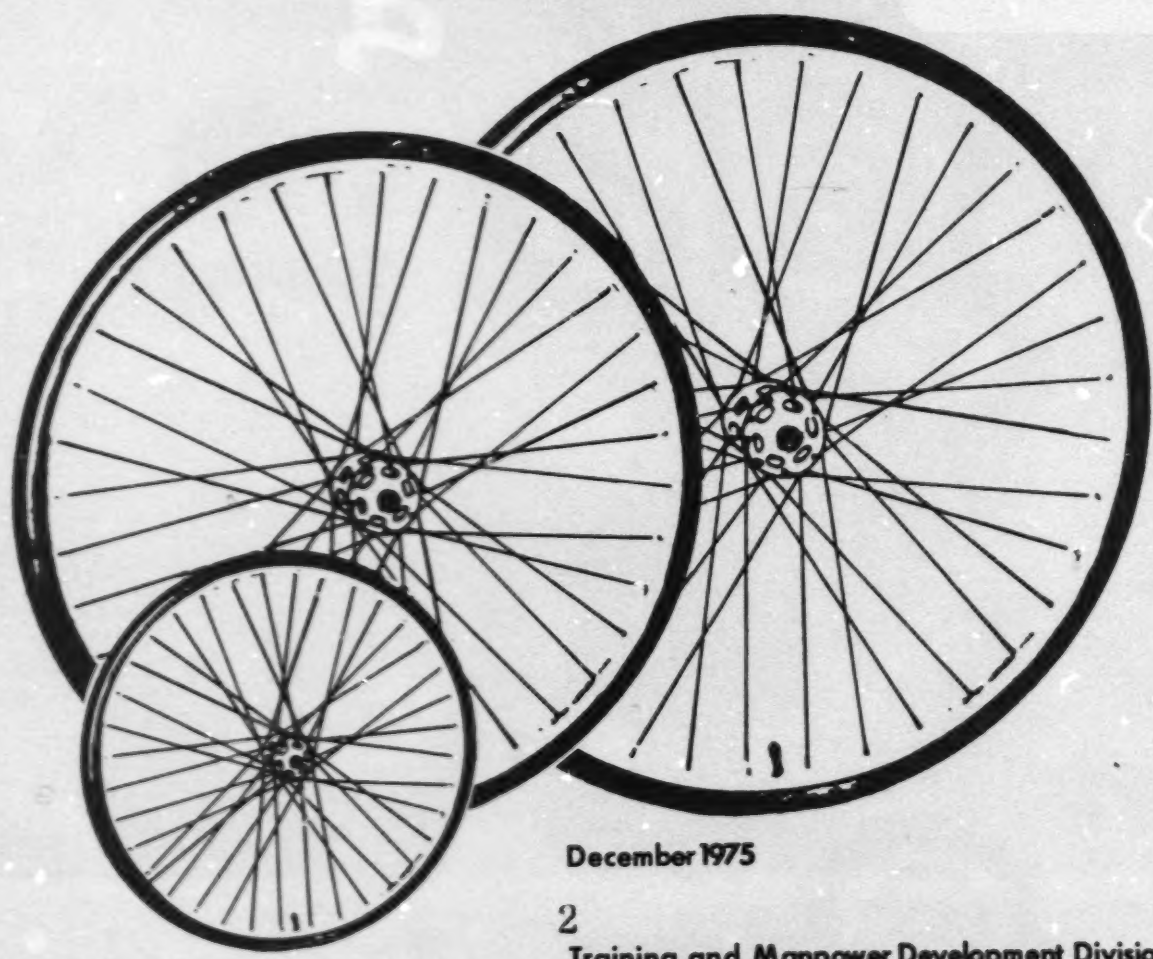
orientation to bicycles

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TRAINING COURSE NO. T34
WORKBOOK

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orientation to bicycles

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December 1975

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INTRODUCTION

The purpose of this workbook and accompanying videotape "Orientation to Bicycles" is to provide personnel having responsibility for investigations or inspections with an overview and technical information on bicycles which will serve as a technical foundation for understanding the bicycle regulation. After viewing the videotape and completing the workbook, the participants should be able to complete the following objectives:

- define the different types of bicycles, including their distinguishing features.
- identify the factors that contribute to bicycle accidents.
- identify the five major systems of bicycles.
- locate and describe specific parts of bicycles.

INSTRUCTIONS FOR USE

This workbook and the accompanying videotape "Orientation to Bicycles" is designed to introduce you to bicycles in general, and to the parts of bicycles, specifically. It will be most effective if you:

1. View the videotape for an overview of bicycles.
2. Read the workbook in sequence, since most of the material will be based upon, or related to preceding information.
3. Complete the written exercises that follow the material in Parts I and II of the workbook.
4. Check your answers with those following each exercise.
5. Use the lightweight model bicycle illustration in Appendix A as a reference guide when reviewing Part II for ease in relating individual parts of the bicycle to the entire bicycle.
6. Finally, fill out the Training Evaluation Form and return it to TMDD, 5401 Westbard Avenue, Bethesda, Maryland 20702. Your evaluation will be useful in possible future revision of this material.

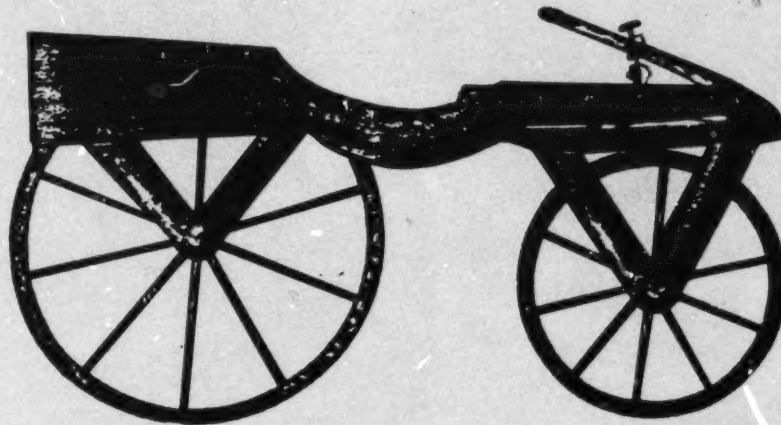
(NOTE: The illustrations in this workbook represent only some of the many different styles and varieties of bicycles and parts of bicycles.)

PART I
INTRODUCTION TO BICYCLES

INTRODUCTION TO BICYCLES

A. History of Bicycles

History indicates that the wheel has been used in transportation for more than 5,000 years - therefore, it's surprising that the earliest bicycle was invented between 1816-1818. A German devised this two-wheeled "pedestrian hobby-horse" which was propelled by the feet pushing directly on the ground.



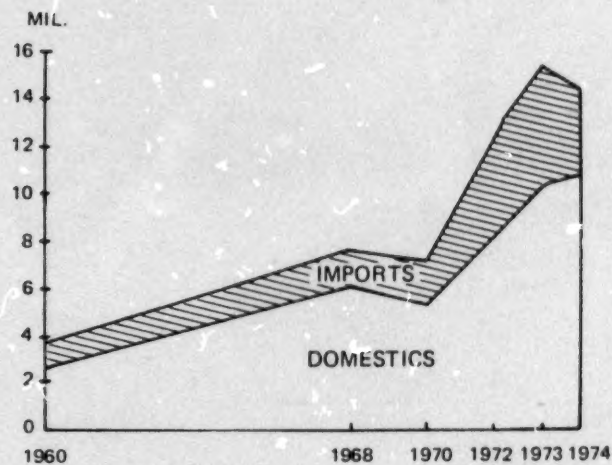
Pedestrian Hobby-Horse 1816-1818

The bicycle has developed substantially since then, into an energy efficient device that uses just the right muscles - those of the thighs, which are the most powerful muscles in the body - in just the right motion - a smooth rotary action of the feet. The bicycle's utility in transportation and its enjoyability in recreation have resulted in an increasing demand for bicycles.

It is estimated that over 100 million Americans are bicycle riders.

The graph below illustrates the rapid growth of the bicycle market. Notice the large increase between 1960 and 1973.

USA BICYCLE MARKET DOMESTIC & IMPORTS



"American Bicyclist and Motorcyclist," March, 1975

B. Types of Bicycles

The two major bicycle models on the market are the highrise and lightweight models. A third, less popular bicycle, is the middle-weight model. Some distinguishing features of these bicycles are:

Lightweights have narrow, high pressure tires, and gearshifts and handbrakes that take coordination and experience to operate safely.

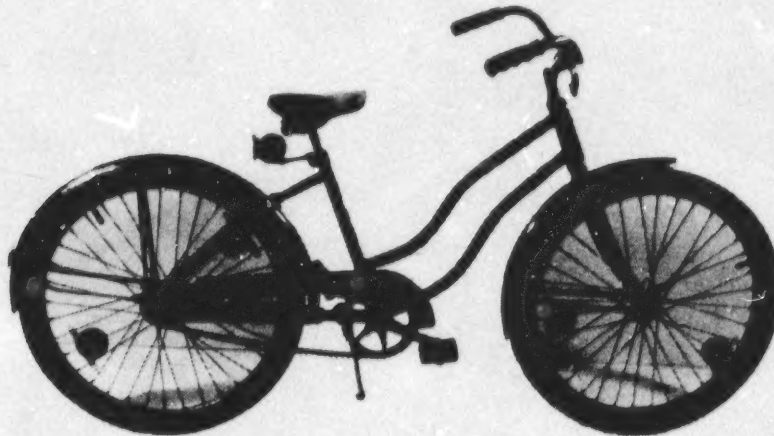


Lightweight Model

They generally have lighter frames than other bicycles and can be ridden easily on hills and long distances. Lightweight bicycles come in two basic styles, touring and sport. Touring bicycles usually have 3 or 5 speeds with rear hub gearshift mechanisms, fenders, and conventional handlebars. Sports (racing) bicycles, on the other hand, generally have dropped handlebars and 5, 10, or 15 speeds.

The lightweight model, known in the early 1960's as the English racer, comprised about 74 percent of the bicycle market in 1974.

The middleweight bicycle comes in various sizes. The typical middleweight is single or two-speed and comes equipped with footbrakes - often called coaster brakes, cushioned seats, and fenders. This bike has larger low pressure tires, and will stand more rough handling than most bikes. This model is sturdy and stable for everyday riding.



Middleweight Model

The highrise model takes its name from the unusually high "banana" seat and handlebars that allow the rider to sit relatively far above the wheels. Even with this additional height, however, highrises are still lower than most middleweights.

The small wheels make turning very easy, but this same feature means that the bike is less stable and takes more skill to balance and more energy to pedal. High handlebars and vertical seatbacks, often called "sissy bars", are fancy but they can obstruct the rider when he/she must dismount quickly.



Highrise Model

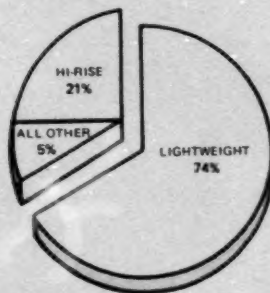
The "sissy bar" projects up behind the seat two inches to two feet (the limit is 5 inches in FR7-16-74) above the level of the seat. The "banana seat" that stretches over the rear wheel almost invites the rider to shift to the back of the seat and do wheelies (lifting the front wheel in the air). This can flip the bike and rider backwards. The seat also encourages riding double, which is a significant cause of accidents.

The highrise model was an instant success starting with its introduction in 1963. In 1973, highrise sales comprised 25% of the bicycle market.

C. Bicycle Market

This graph portrays sales of bicycles in the U. S. in 1974: lightweights - 74 percent; highrises, which captured 25% of the market in 1973, dropped off to 21 percent in 1974; and "other" which includes middleweights - only 5 percent.

USA BICYCLE MARKET
DOMESTIC & IMPORTS



1974

* "American Bicyclist and Motorcyclist", March 1975

D. Bicycle Accidents

Bicycle-related deaths and injuries have grown in number rather consistently through the years as bicycle sales have risen. It has been estimated that over one million children and adults are injured each year in bicycle-related accidents. Of this total, about 460,000 people received emergency room treatment in 1974. In 1975, bicycles ranked number one on the Consumer Product Safety Hazard Index.

CPSC has analyzed the factors relating to bicycle accidents. Bicycle accidents fall into three main hazard categories which frequently overlap:

- environmental
- human
- mechanical

Environmental factors include poor roadway conditions, traffic movement, obstruction of view, inclement weather, and darkness.

Human factors include stunting, careless riding in traffic, neglecting the necessary maintenance of bicycles, failure to adhere to the rules of the road, and improper selection of bicycles. For example, many times, parents select bicycles too large for children with the idea that the children will "grow into them", which often results in loss of control.

Mechanical factors include brake failure, wobbling or disengagement of the wheel, steering mechanism failure, spoke breakage, difficulty in shifting gears, chain slippage and pedal problems.

It should be noted that 63 percent of all bicycle accidents are due to loss of control. The factors causing loss of control overlap into

three areas: human, environmental, and mechanical.

Loss of control is often due to:

- | | | |
|-----------------------|---|---|
| human factors | { | 1. riding double |
| | | 2. stunting |
| | | 3. jumping curbs |
| environmental factors | { | 1. foot slippage off pedal
(e.g., due to rainy weather) |
| | | 2. obstacles in road (holes, etc.) |
| mechanical factors | { | 1. entanglement of feet, hand or
clothing in parts of bike |
| | | 2. failure of braking system |
| | | 3. pedal problems |
| | | 4. spoke breakage |

CPSC has had substantial insight into the bicycle injury problem and has studied typical accident patterns with the aid of the NEISS system. As a result, it has been concluded that as bicycle sales and the number of bike riders increased, the frequency of bicycle injuries increased proportionately.

EXERCISES

Types of Bicycles

1. List two characteristics of the lightweight bicycle.

a. _____

b. _____

2. List two characteristics of the middleweight bicycle.

a. _____

b. _____

3. List 3 characteristics of the highrise bicycle.

a. _____

b. _____

c. _____

Bicycle Accidents

4. List some examples of environmental, human, and mechanical factors that are related to bicycle accidents.

a. Environmental

(1) _____

(2) _____

(3) _____

b. Human

(1) _____

(2) _____

(3) _____

c. Mechanical

(1) _____

(2) _____

(3) _____

ANSWERS

Types of Bicycles

1. Any of the following answers are correct for the lightweight bicycle:
 - easily ridden on hills and long distances
 - two basic models - touring and sport
 - narrow, high pressure tires
 - equipped with gearshifts and handbrakes
 - takes coordination and experience to operate safely
 - usually has 3 or more speeds
2. Any of the following answers are correct for the middleweight bicycle:
 - sturdy and stable for everyday riding
 - usually single or two-speed
 - usually equipped with coaster brakes
 - has fenders
 - has low pressure tires
 - will stand more rough handling than lightweight bicycles
3. Any of the following answers are correct for the highrise bicycle:
 - high "banana" seat
 - high handlebars
 - lower than middleweight bicycles
 - small wheels
 - less stable, takes more skill to balance
 - vertical seatbacks

Bicycle Accidents

4. Any of the following answers are correct:

- a. Environmental - poor roadway conditions
 - traffic movement
 - obstruction of view
 - inclement weather
 - darkness
- b. Human
 - stunting
 - careless riding in traffic
 - neglecting maintenance of bicycle
 - failure to adhere to the rules of the road
 - improper selection of bicycle
- c. Mechanical
 - brake failure
 - wobbling or disengagement of the wheel
 - steering mechanism failure
 - spoke breakage
 - difficulty in shifting gears
 - chain slippage
 - pedal problems

PART II
PARTS OF BICYCLES

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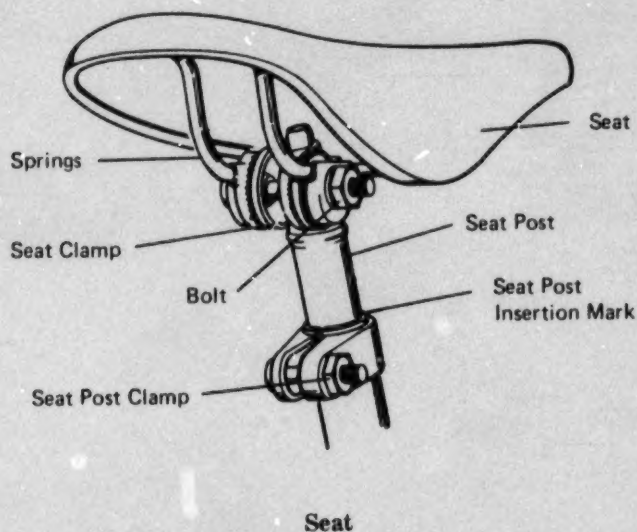
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PARTS OF BICYCLES

A. Seat (Saddle)

The first thing a cyclist does is sit on the seat and perhaps check the "fit" of the bicycle. The bicycle seat is sometimes called a "saddle". The seat is usually made of leather or plastic and its size, shape, and durability varies widely.

The seat is attached to a heavy wire frame which helps reduce the road shock, and is then attached to the seat post by clamp and bolt hardware.



The seat post and bolts permit the adjustment of the height of the seat. The seat post should not be adjusted upward from the seat post insertion mark. It is necessary that a sufficient amount of the seat post be inserted in the frame so that the seat post will not bend or break.

The seat clamps permit adjustment of the forward or rear position of the seat.

B. Steering System

The second step a rider would probably take is to put his/her hands on the handlebars.

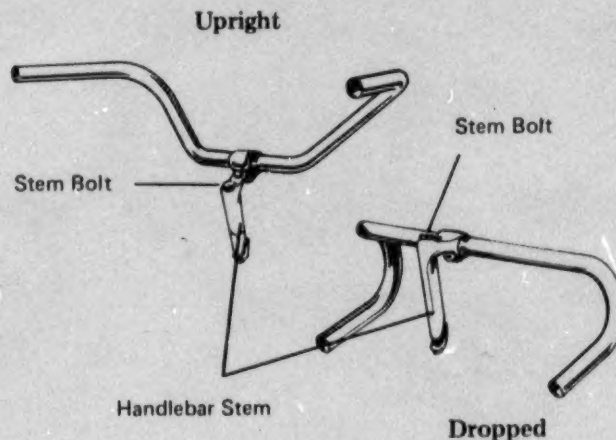
The handlebars are generally constructed from steel and are made in many different shapes.

The most common shapes are the dropped handlebars and the upright handlebars shown here.

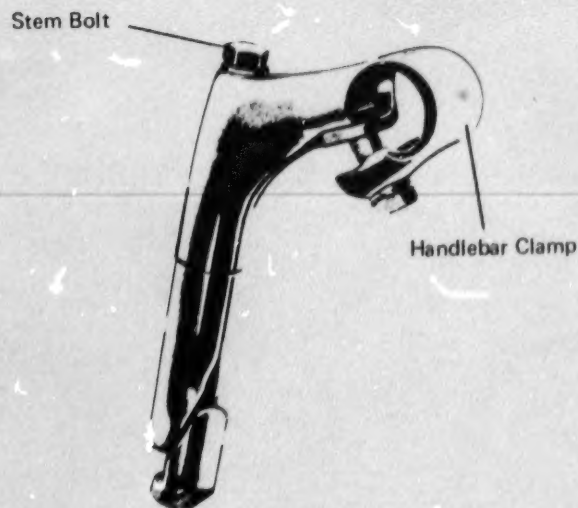
The dropped handlebars can be placed in a variety of positions.

The parts of the handlebar that are gripped to steer the bicycle are called the handgrips. The handlebars are held to the handlebar stem by a clamp (see next page for illustration of clamp).

The upright handlebars usually have rubber or plastic grips, while the dropped handlebars are generally wrapped with cloth or plastic tape to improve the rider's grasp. Protective caps are attached to the handlebar ends to protect the rider from sharp edges. (See Appendix A for more illustrations of handlebar styles.)

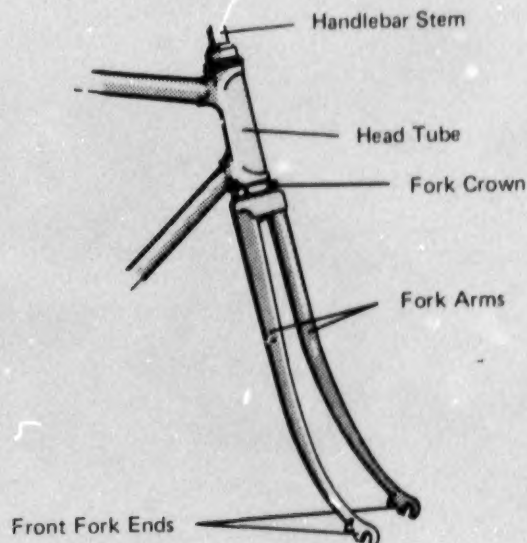


The handlebar stem, sometimes referred to as a "gooseneck" or "extension", is a curved or angled piece of rod or tube. The handlebar stem is secured inside the front fork tube by tightening the stem bolt. The stem bolt causes the handlebar stem to expand inside of the front fork tube.



Handlebar Stem

The head tube holds the front fork of the bike to the frame. Attached to the top of the fork is a fork tube which can't be seen from the outside because it's inside the head tube of the bicycle. The fork tube projects up from the main body of the front fork through the head tube and is held in position in the head tube by bearings. When the handlebars are turned, the handlebar stem (which is secured inside the



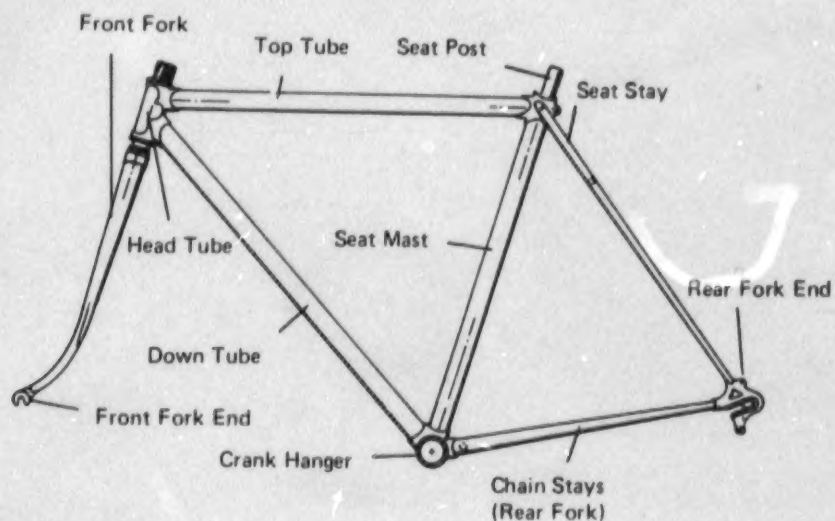
fork tube in the head tube) turns the front fork to steer the bicycle.

The front fork is also referred to as the fork. It holds the front wheel to the bicycle. The fork can be solid or tubular, and it extends downward on both sides of the front wheel.

At the lower end of the fork tube is a visible fork crown into which two arms are attached. At the end of the fork arms are little upside-down u-shaped pieces called fork ends, where the wheel can be connected and disconnected from the frame. The wheel axle attaches to the fork ends.

C. Frame System

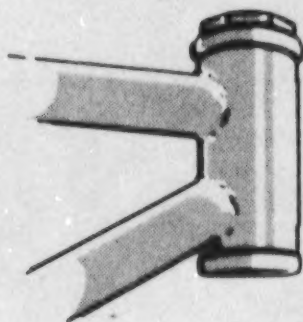
To the rear of the fork is the bicycle frame. The frame is the heart of the bicycle and consists of a horizontal top tube, a head tube at the front of the bike, a seat mast under the seat, a diagonal down tube from the head tube to the crank hanger, chain stays from the crank hanger to the rear fork ends, and seat stays from the rear fork ends to the top of the seat mast.



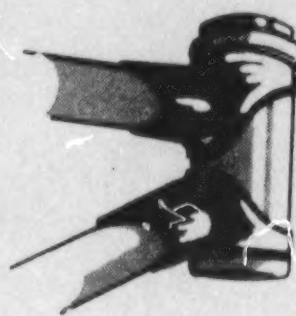
Male Frame Style

The female frame is similar to the male frame; however, it does not have a top tube (see illustration in Appendix A).

If the frame is somewhat smooth where the frame members intersect or are joined, then this probably is a brazed or welded frame. On the other hand, if the members of a frame are attached with metal reinforcements, this is a brazed lugged frame. The metal reinforcements are called lugs.



Brazed or Welded Frame

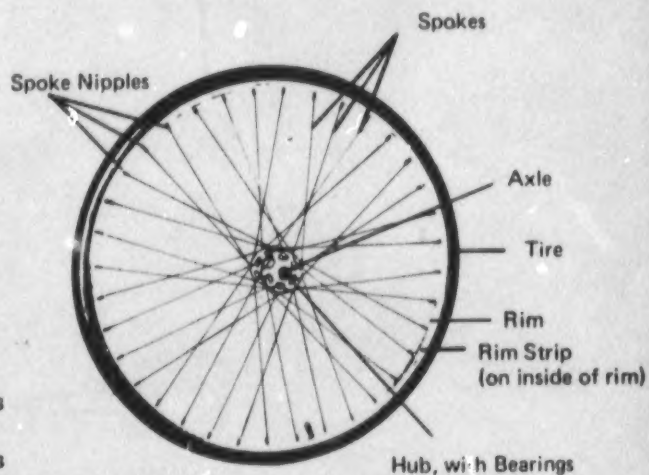


Brazed Lugged Frame

D. Wheel System

The wheels are located on the front and back of the bicycle. Each wheel has an axle, a hub with bearings, spokes, spoke nipples, a rim, a rim strip, a tire, and usually a tube.

The front wheel is attached to the front fork, and the rear wheel is attached to the seat and chain stays (rear fork). The wheels are attached to the forks by two nuts

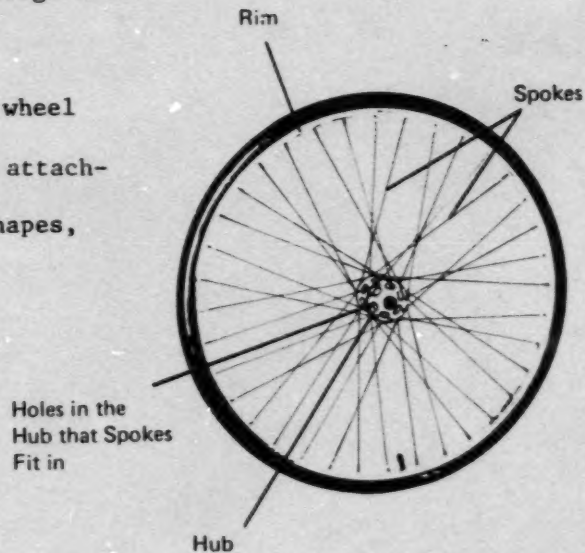


Quick Release Mechanism

This diagram illustrates the exploded view of a hub assembly. The components are arranged along a central horizontal axis. From left to right, the parts are: a Locknut, a Washer, a Cone, a Bearing, a Hub Flange, a Hub Shell, another Bearing, an Axle, an Axle Washer, and an Axle Nut. Each component is labeled with text and leader lines pointing to it. The Hub Flange and Hub Shell are shown as a single unit in the center. The Axle is a long, thin rod passing through the center of the hub assembly.

The spokes are the wires that hold the thin metal rim in a round shape. The spokes are stuck through holes in the flanges of the hub.

The rim is the part of the wheel where one end of the spokes are attached. There are various sizes, shapes, and kinds of rims.

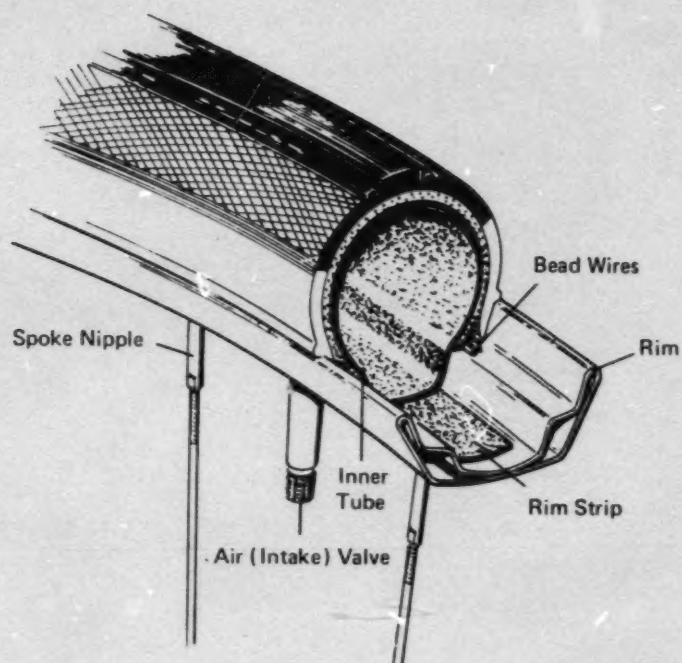


Most bicycle tires, except the non-pneumatic tires (tires without a rubber inner tube) used on very inexpensive children's bikes, are equipped with rubber inner tubes and are called pneumatic tires.

There are two kinds of pneumatic bicycle tires.

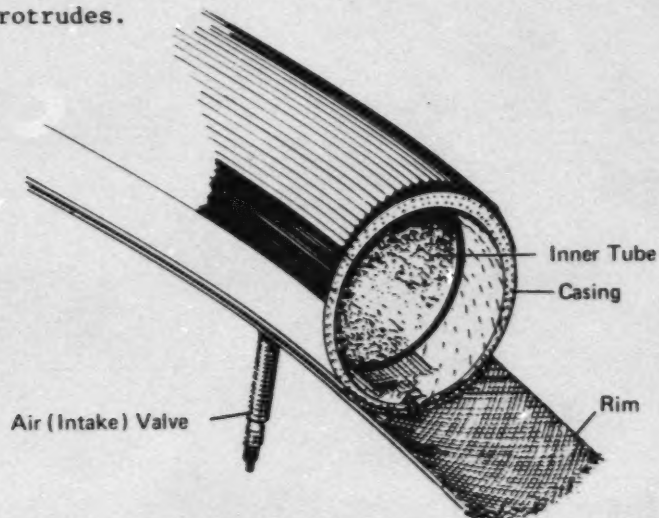
First, the clincher tire, also known as the wired-on tire--this tire has a projection at the base of the sidewall; the projection rests in the hollow or hook section of the wheel rim. The air pressure within the tire presses the sidewall projection into the wheel rim cavity, preventing the tire from blowing off the rim.

There are different grades of clincher tires. Most average priced bicycles have the lower costing clincher tires.



Clincher (Wired-on) Tire

Second, the tubular tire-- also known as the "sew-up" tire looks like a large skinny doughnut. In this tire, the tube is inserted in the casing and the casing is sewn together all around except where the valve stem protrudes.



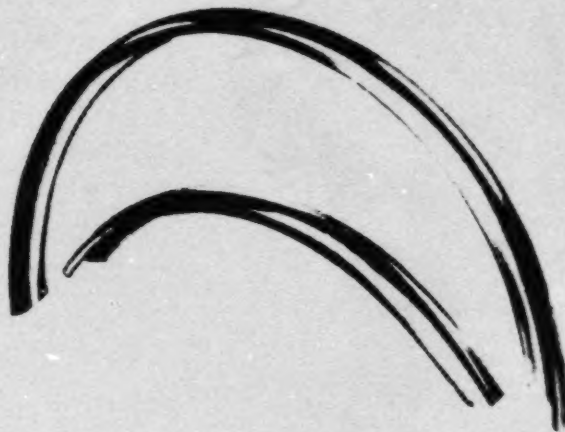
Tubular (Sew-up) Tire

4

The tubular tire incorporates the tire and the tube into one unit.

It is generally made thinner and may have less tread than other tires. This tire is used on racing and some touring bicycles.

Fenders or mud guards may be positioned over the front and rear wheels. They keep the mud, stones, and water that the wheel may pick up, from hitting the rider. Fenders are positioned at the back of the front wheel and the front of the back wheel.



Fenders

EXERCISES

Seat

1. What is the purpose of the seat post and bolts?

2. What is the purpose of the seat post clamp?

3. What is the purpose of the seat post insertion mark?

Steering System

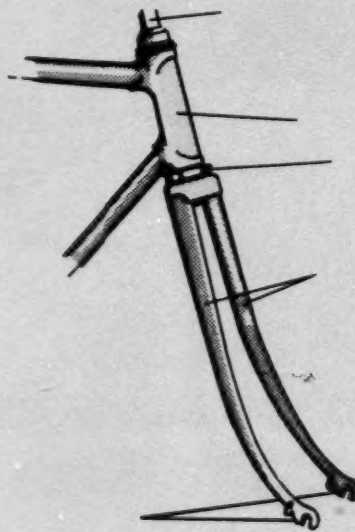
4. What are the two most common shapes of handlebars?

a. _____

b. _____

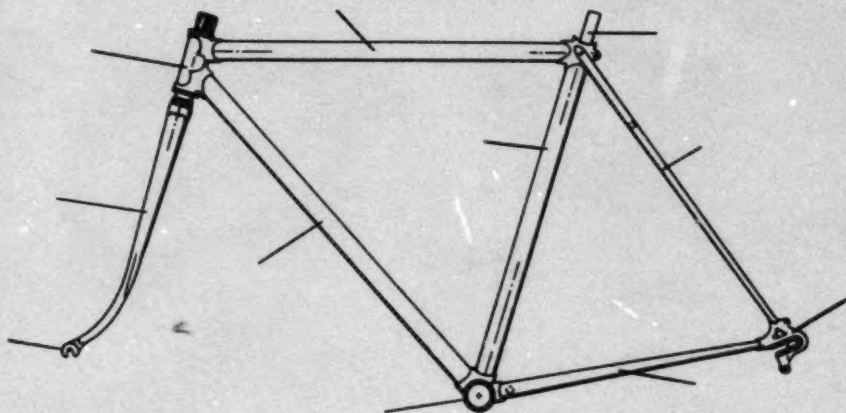
5. Label the following part of the bicycle using the

terms: handlebar stem, head tube, fork arms, fork crown, front fork ends.



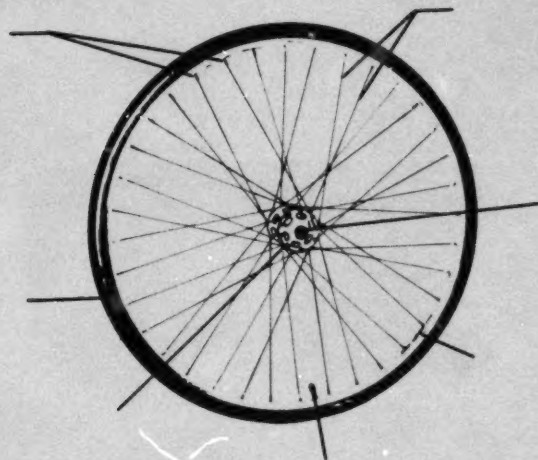
Frame System

6. Label the frame below, using the following terms: seat post, head tube, seat mast, top tube, crank hanger, chain stays, seat stay, rear fork end, down tube, front fork, front fork end.



Wheel System

7. Label the wheel below, using the following terms: hub with bearings, spokes, spoke nipples, rim, tire, axle, air valve.



8. What is the purpose of the quick release lever?

9. What parts of the bicycle are the spokes attached to?

10. What are two purposes of the hub?

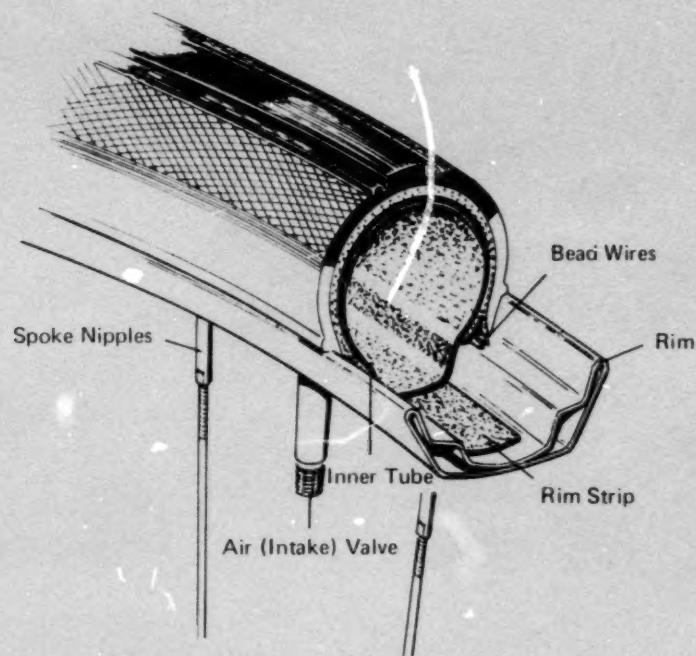
11. What are pneumatic tires?

12. What are the two different kinds of pneumatic tires?

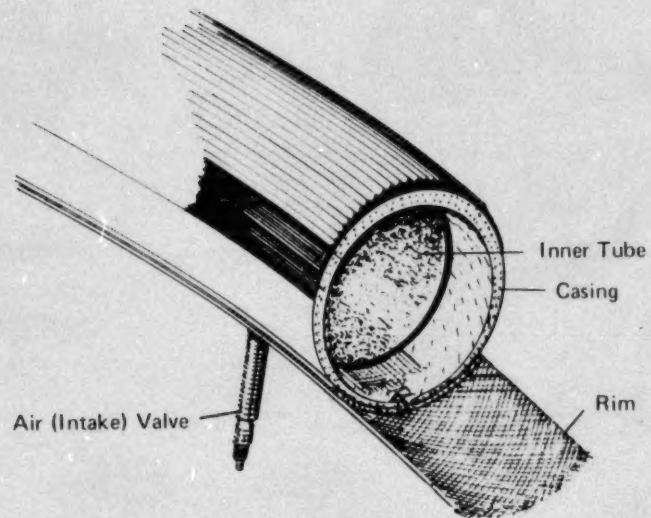
a. _____

b. _____

13. Label the two types of tires below:



a. _____



b. _____

ANSWERS

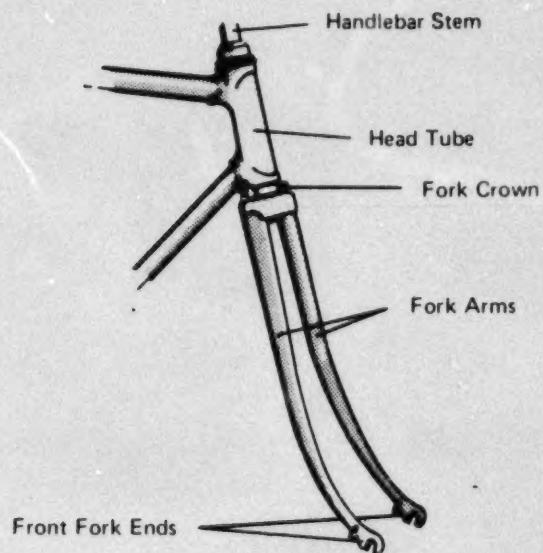
Seat

1. To permit the adjustment of the height of the seat.
2. To permit adjustment of the forward or rear position of the seat.
3. To assure that a sufficient amount of seat post is inserted in the frame so that the post will not bend or break.

Steering System

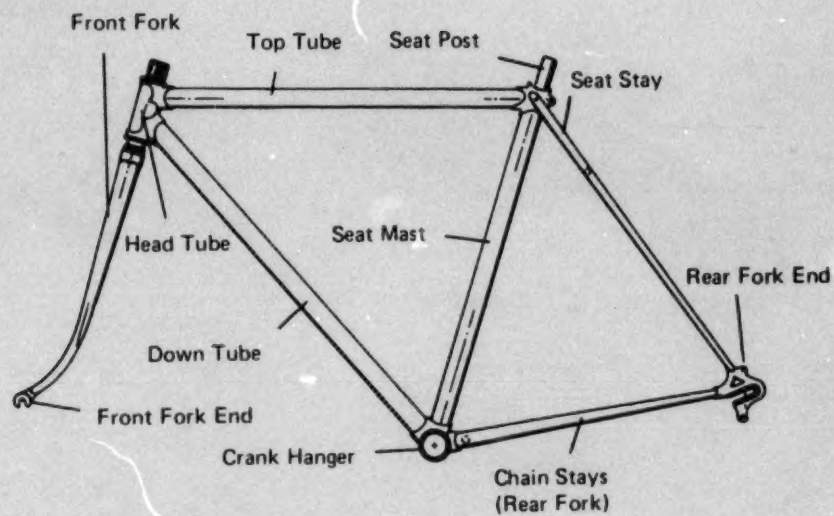
4. a. Dropped handlebars
b. Upright handlebars

5.



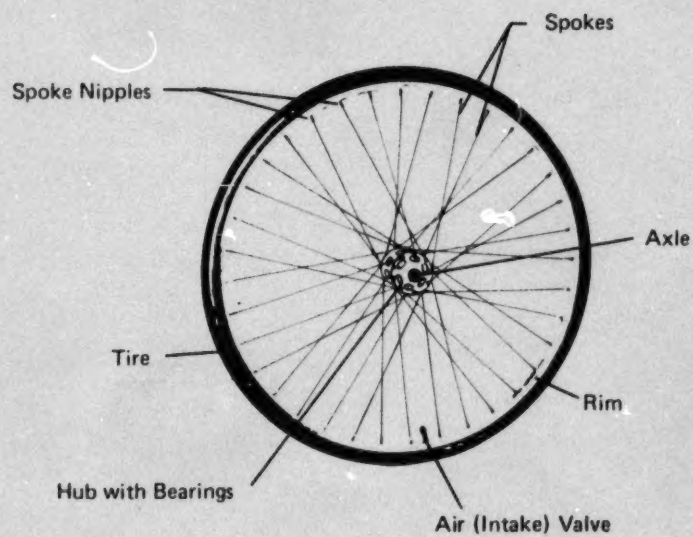
Frame System

6.



Wheel System

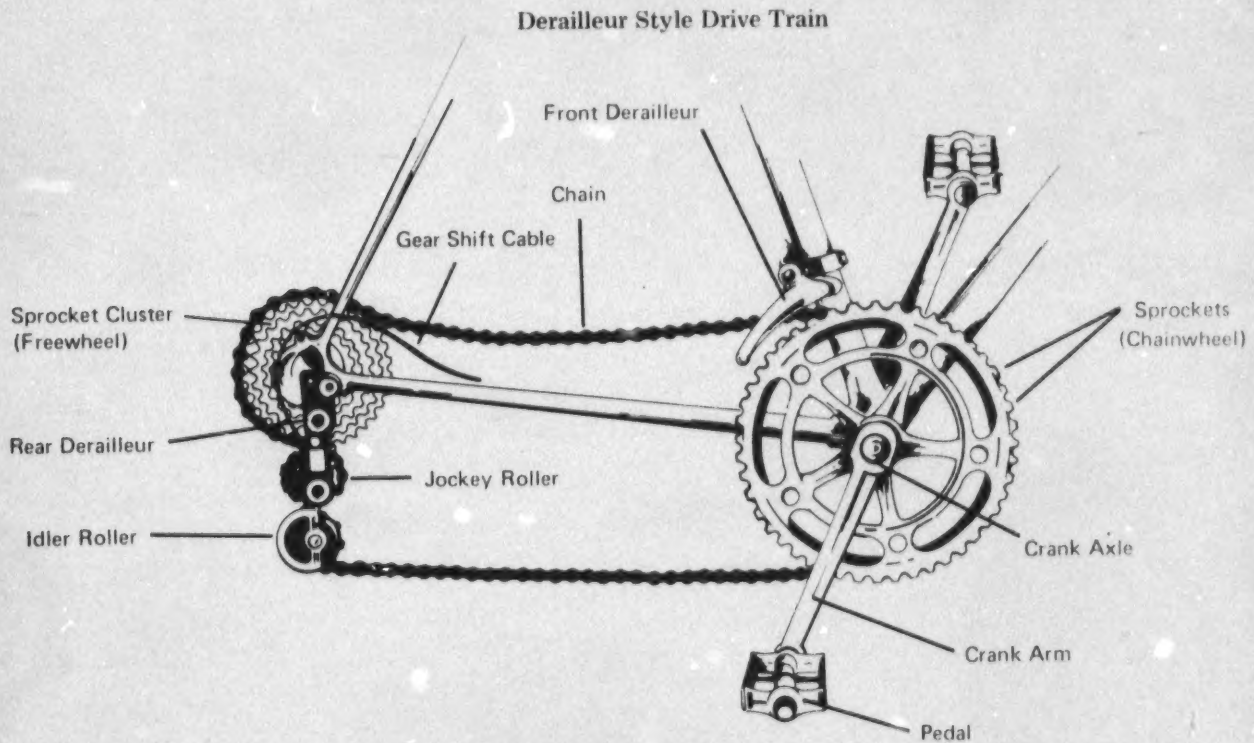
7.



8. To permit removal of the front or rear wheels quickly.
9. The hub (at one end) and the rim (at the other end).
10. To hold one end of the spokes, and to hold the axle and bearings.
(the wheel axle attaches into the fork ends of the fork).
11. Tires that have rubber inner tubes.
12. a. Clincher (wired-on)
b. Tubular (sew-up)
13. a. Clincher (wired-on)
b. Tubular (sew-up)

E. Drive System

If the frame of the bicycle is its heart, the drive train is the bike's blood and guts. Its front half consists of the pedals, the crank set,* the crank hanger,* sometimes a front derailleur (changer), and the front sprockets, sometimes called chain wheels. Between the front and back halves there is a chain. The back half of the drive train consists of the rear sprockets and at times a derailleur type speed changer.

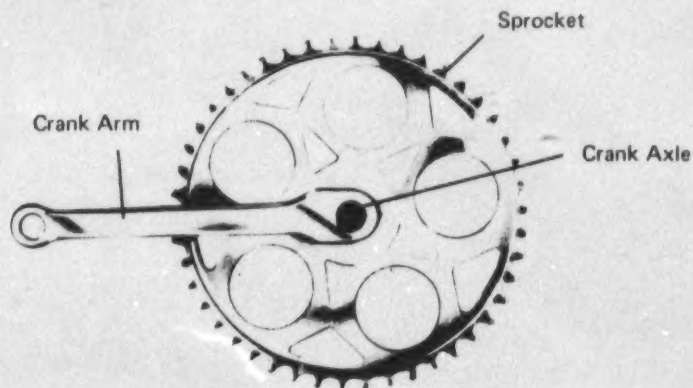


* The entire crank set and crank hanger are not pictured here. The crank set consists of the crank arms, spindle, drive sprocket and miscellaneous hardware. The crank hanger is the part of the bicycle which holds the crank arms in the frame and lets them spin freely.

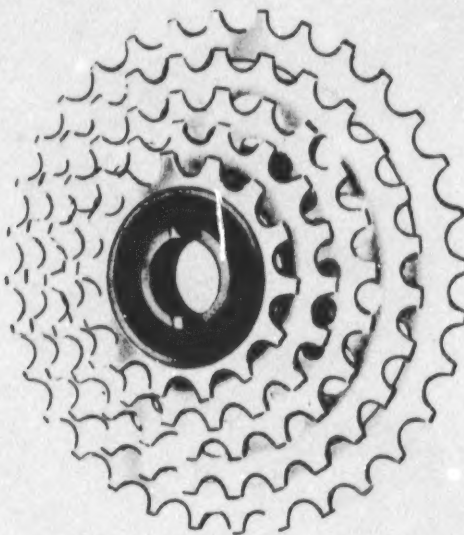
The front sprocket is the round metal wheel with gear teeth around it that pulls the chain when the bicycle is pedaled. The rear sprocket is generally a smaller metal sprocket (except in some multispeed bicycles) with gear teeth for the chain to ride on, and is attached to the chain side of the rear wheel.

The sprockets on multispeed bicycles vary widely in size. The larger the sprocket is, the more teeth it has; the smaller the sprocket, the less teeth it has.

On multispeed bicycles a series of sprockets (as many as five in number) are mounted side by side on the rear wheel - these sprockets provide changes in derailleur gearing. Another set of sprockets may be mounted on the pedal cranks (usually one, two, or three sprockets). To figure out the bicycle speed, multiply the number of front sprockets by the number of rear sprockets. For example, if there are two sprockets in the front and five sprockets in the rear, then the bicycle has 10 speeds. If there are three sprockets in front, and five sprockets in the rear, then the bicycle has 15 speeds.



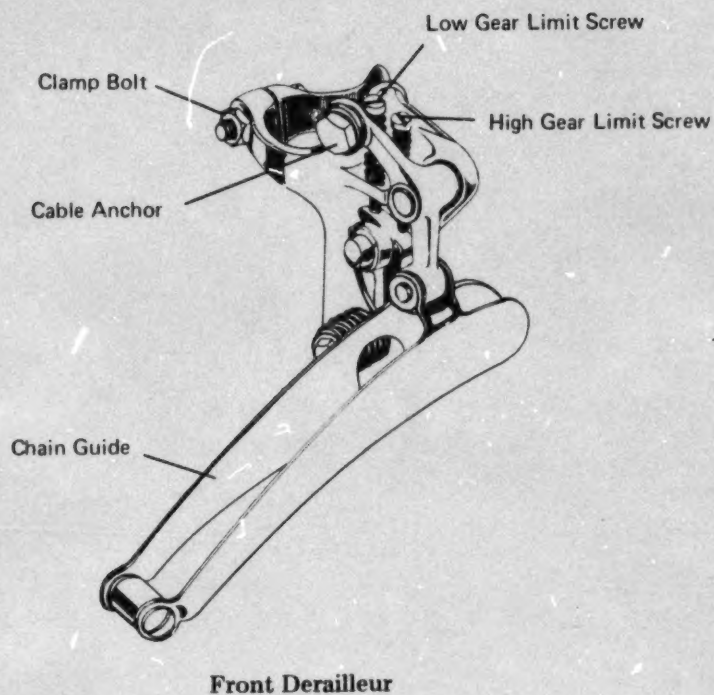
On ten speed bikes, there are five rear sprockets attached in a cluster to a freewheel gear cluster, also called the rear cog assembly. The freewheel gear cluster facilitates the shifting of gears in multi-speed bicycles. It prevents the bike from going backwards when the rider pedals backward.



10 Speed Freewheel Gear Cluster

The derailleur (pronounced "dē RAIL yer") is a speed changer which moves the chain from larger to smaller "sprockets" and vice versa, thus increasing or decreasing the gear ratio. A shift lever is connected to each derailleur. The front and rear derailleurs are very different in construction and function (see graphics on next page).

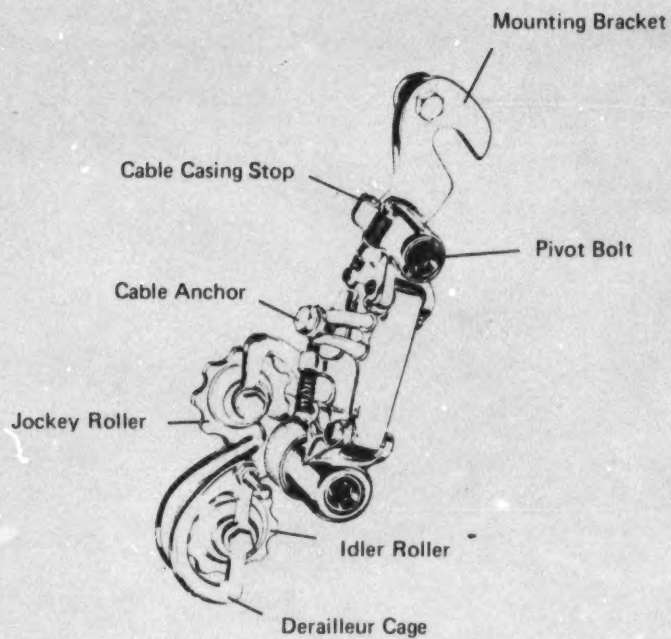
The front derailleur has a metal cage which moves the chain from sprocket to sprocket.



The rear derailleur consists of a derailleur body and a cage with two chain rollers called jockey rollers and idler rollers.

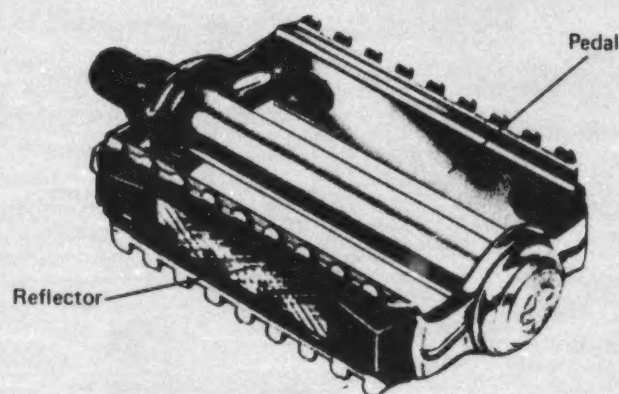
The jockey roller holds the chain tight (keeps tension on the chain) and the idler roller presses against the chain to guide it or to take up slack.

The derailleur cage holds the rear derailleur idler and jockey rollers.



Rear Derailleur

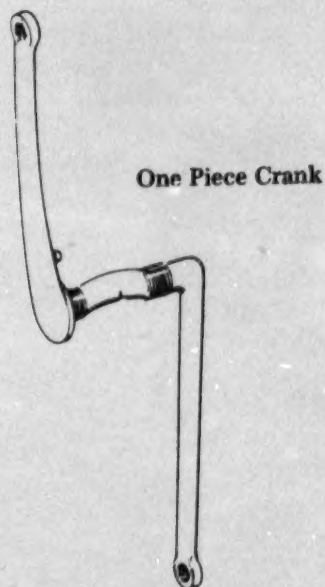
Pedals are what you push on with your feet to make the bicycle move. All pedals should have tread surface except for those intended to be used only with toe clips. The toe clips are cages on the pedals that hold your feet in position, and keep them from sliding off the pedals. These are often used in long-distance riding because they make it easier for a rider to keep an even pace and they save the energy the rider would waste trying to keep his feet in place on the pedals.



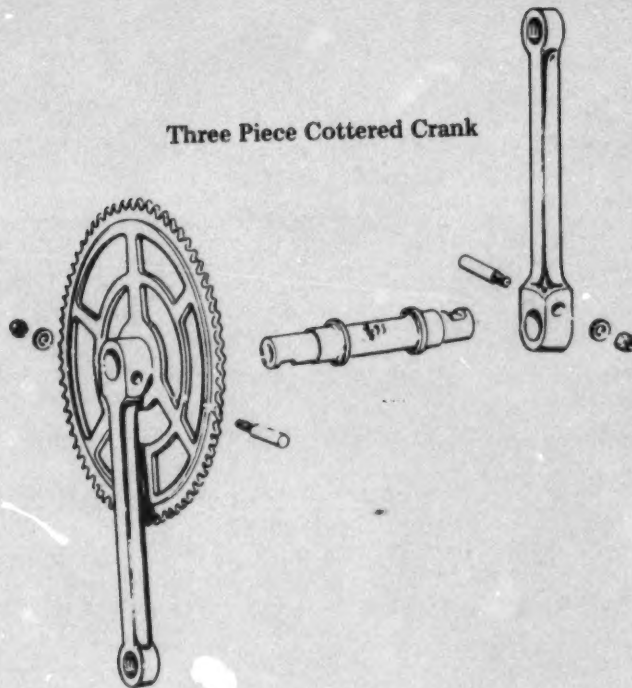
Cranks are the sturdy bars of solid metal to which the pedals are attached. The crank hanger is the part of the bicycle which holds the crank assembly in the frame, and lets it spin freely.

There are three main types of crank hanger constructions:

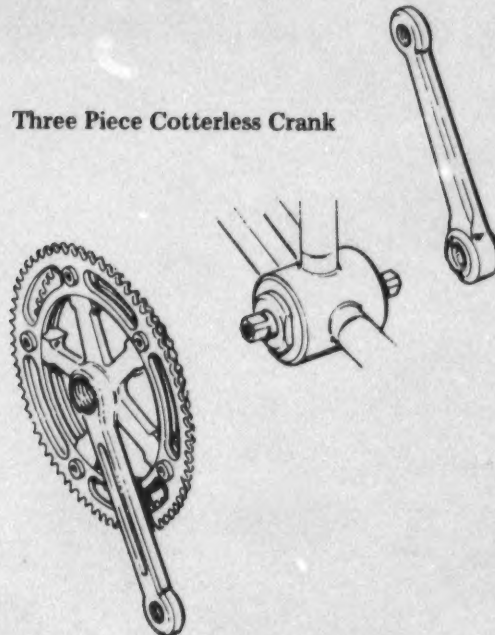
1. The one piece crank -- a single piece of forged metal, usually steel.
2. The three piece cottered crank (cottered is an English term for the wedge pin that joins the crank to the axle). It consists of a cottered crank spindle (axle) and two crank arms. connected by a crank cotter and crank cotter nut.
3. The three piece cotterless type consists of a cotterless crank spindle (axle) and two cotterless crank arms. The crank arms are connected to the crank spindle by bolts.



Three Piece Cottered Crank

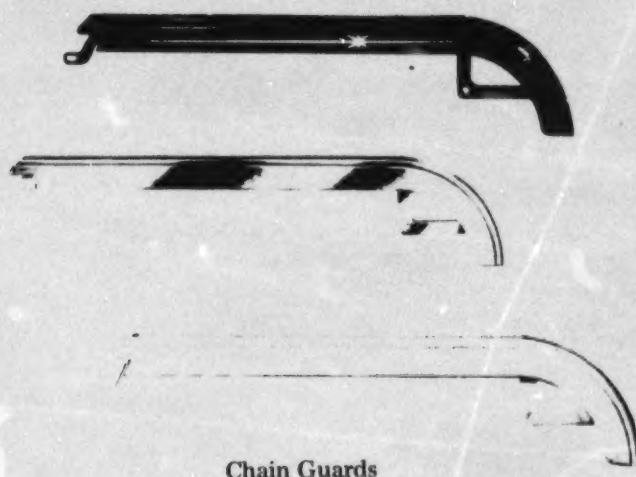


Three Piece Cotterless Crank



The chain has rollers riveted to connecting plates which, in turn, connect the front and rear sprockets.

Chain guards are used on bicycles that have a single front sprocket and a single rear sprocket. Multi-gear bikes have disc chain guards on the rear wheel to protect the spokes from the chain.



Chain Guards

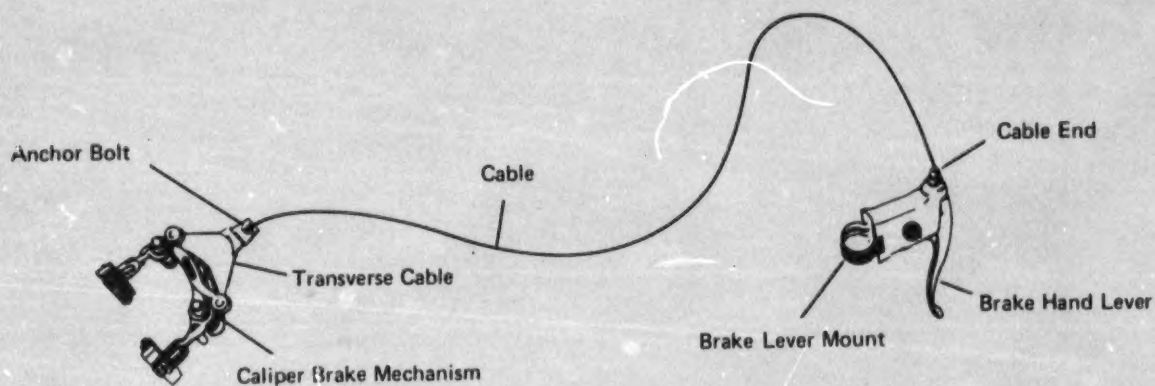
F. Brake System

Bicycle brakes come in two basic types: Coaster or pedal operated brakes, and caliper or hand-operated brakes.

Caliper brakes are usually on multi-speed bicycles and coaster brakes are usually on single speed bicycles. However, 3 and 5 speed bicycles equipped with coaster brakes and caliper brakes are becoming popular.

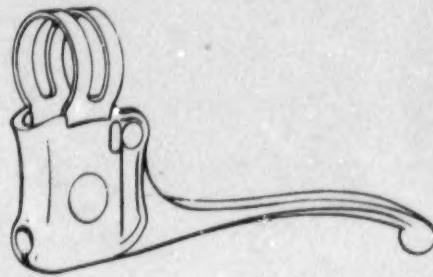
The caliper brakes stops the bicycle by putting frictional force on the wheel. This system consists of hand levers, a caliper brake, and a cable unit.

There is a hollow flexible tube called a cable housing between the brake lever mount, which is located on the handlebars and the cable hanger which is located on the frame. The cable housing is flexible, so that the handlebar can turn back and forth. Through the cable housing is a cable which is attached to the brake hand lever at one end, and the caliper brake mechanism at the other end.



Caliper Braking System

The brake hand lever actuates the brakes, and is attached to the handlebars either by 1 or 2 screws. There is commonly a hand lever on each end of the handlebar; one stops the front wheel, and one the rear. When the lever is pressed by hand, it pulls the cable through the cable housing and pinches together the arms of the caliper brake. These arms are called the inner and outer brake arms.



Brake Hand Lever

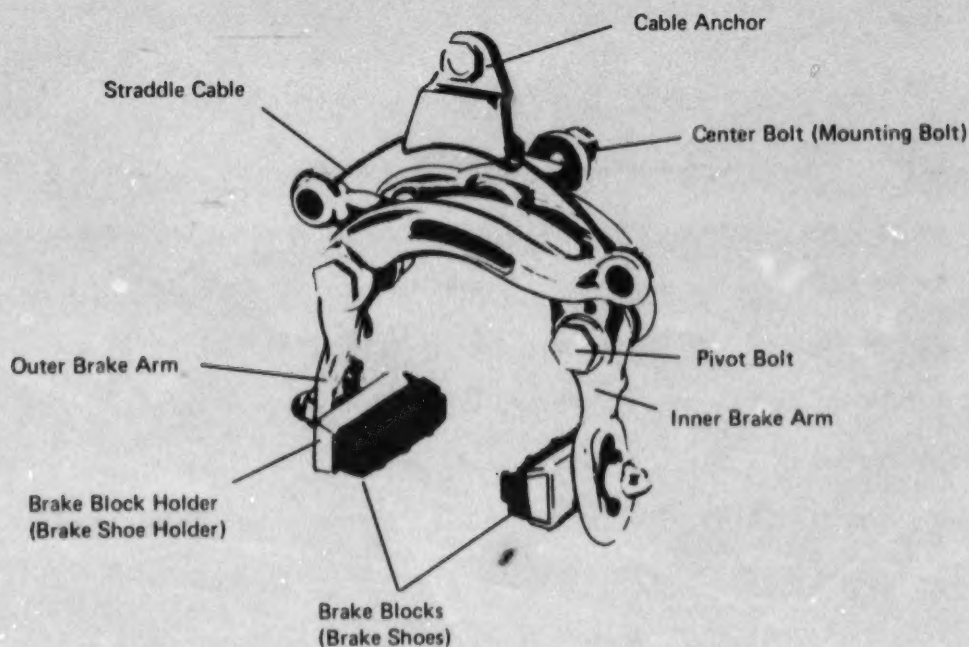
Brake blocks (or brake shoes, as they are often called) are blocks of material that are attached to the brake arms. These brake blocks press against the wheel rim to stop the wheel. When the hand lever on the handlebars is released, a spring in the brake arms forces the brake block away from the wheel rim.

All caliper brake systems have adjusting screws, called barrel adjustors, which are located on the front and rear cable hanger. The barrel adjustor is used to make fine adjustments on the brake shoe's contact with the wheel rim.



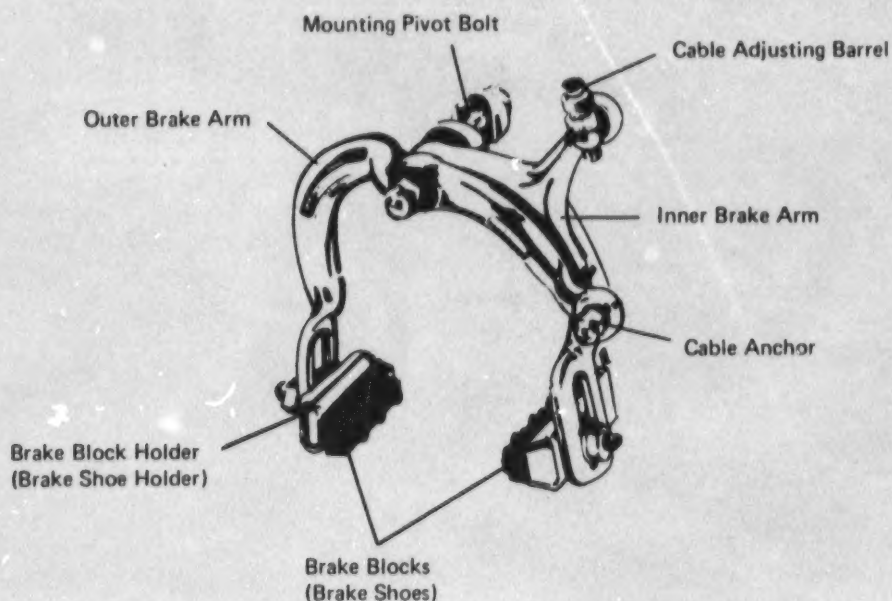
There are two classifications of caliper brakes --center pull and side pull.

On center pull caliper brakes (see next page), the main cable is attached to the cable anchor and centered on the straddle cable. When properly adjusted, squeezing the brake lever pulls the main cable which causes both pivot arms to press the brake shoes against the wheel rim.



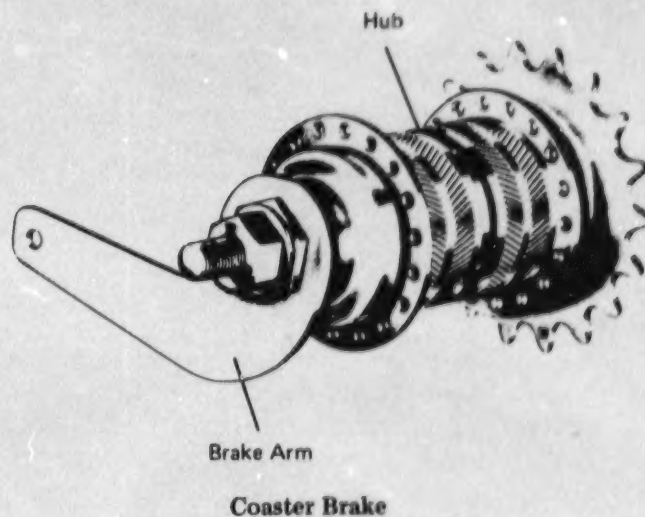
Center Pull Caliper Brake

On side pull caliper brakes, the brake cable pulls one arm and the cable housing pushes the other arm to bring the brake shoes in contact with the wheel rims. Side pull brakes are generally on less expensive bikes.



Side Pull Caliper Brake

Coaster brakes are engaged by back pedaling and are used in many children's and some adult-model bicycles. The coaster brake is operated by means of the crank arm through the drive chain. The brake arm is attached to the frame by a strap secured with a bolt and nut. The purpose of the brake arm is to hold stationary one-half of the coaster brake mechanism. There are two common coaster brake designs. In the first kind, the rotating and stationary disks inside the hub are pressed together by a rotating screwlike device to cause braking. In the second kind, the expanding shoes are pressed against the inner surface of the hub by conical wedges to cause braking.



EXERCISES

Drive System

1. Match the corresponding terms in the left column with the letters in the right column. Use all of the lettered descriptions.

front sprocket	_____	a. prevents the bike from going backwards when the bike is pedaled backwards
rear sprocket	_____	b. has gear teeth for the chain to ride on
freewheel gear cluster	_____	c. also called rear cog assembly
		d. vary widely in size
		e. generally a smaller sprocket (except for multispeed bicycles)

2. Define the derailleur.

3. Match the corresponding terms in the left column with the letters in the right column.

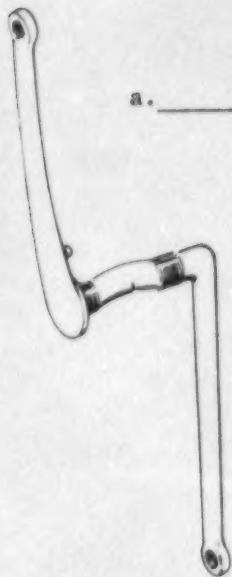
front derailleur	_____	a. consists of jockey and idler rollers
rear derailleur	_____	b. holds the idler roller and jockey roller in place
jockey roller	_____	
idler roller	_____	

(this question continued on next page)

derailleur cage _____

- c. moves the chain from sprocket to sprocket
- d. holds the chain tight (keeps tension on the chain)
- e. presses against the chain to guide it or take up slack

4. Label the three types of cranks below, using the following terms:
One-piece crank, three piece cottered crank, three piece cotterless crank.

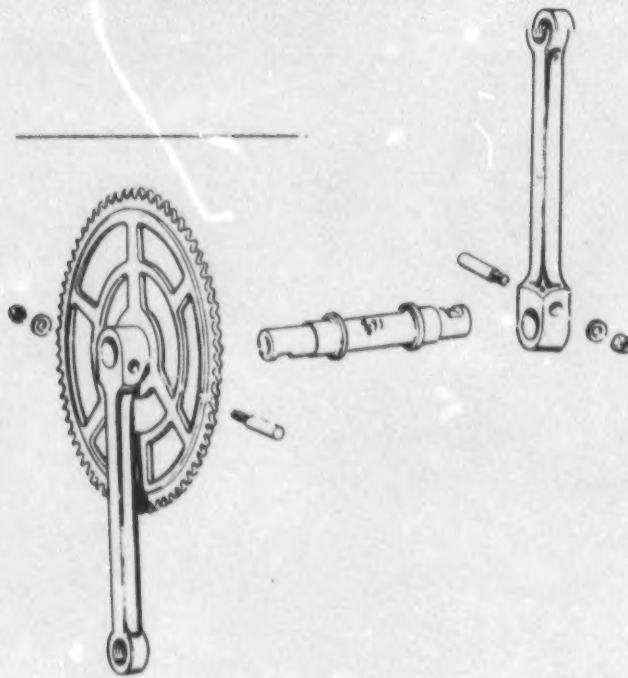


a. _____

b. _____



C. _____

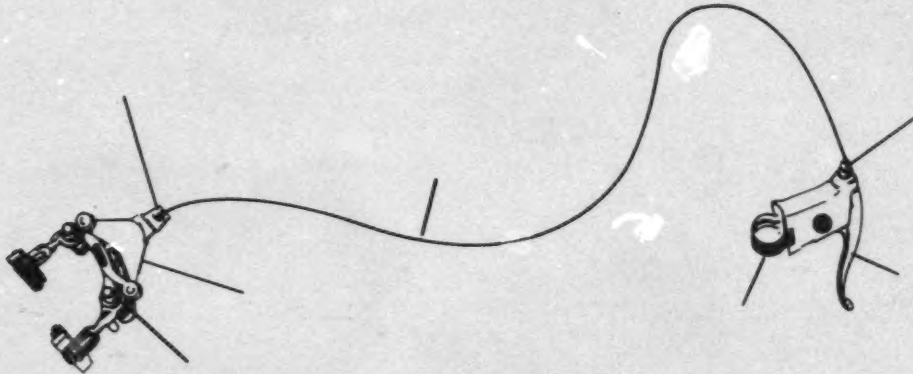


Brake System

5. What are the two basic types of brakes?

6. What type of bicycles are these two types of brakes usually found on?

7. Label this drawing, using the following terms: caliper brake mechanism, cable, brake hand lever, brake lever mount, cable end, anchor bolt, transverse cable.



Caliper Braking System

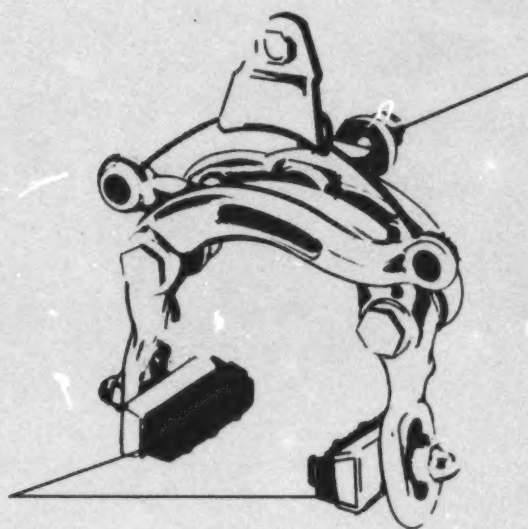
8. What happens when a person squeezes the hand lever?

9. What are brake blocks?

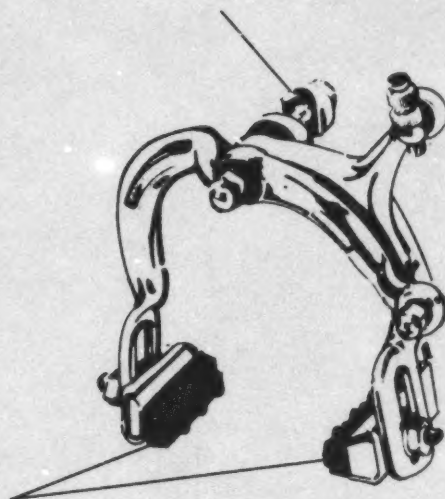
10. What happens when a person releases the hand lever?

11. What is the purpose of the barrel adjuster?

12. Identify the following caliper brakes as side pull or center pull and label the parts as required.



a. _____



b. _____

13. What purpose does the coaster brake arm serve?

14. How are coaster brakes engaged?

ANSWERS

Drive System

1. front sprocket b,d
rear sprocket b,d,e
freewheel gear cluster a,c

2. A speed changer, that moves the chain from larger to smaller sprockets.

3. front derailleur c
rear derailleur a,c
jockey roller d
idler roller e
derailleur cage b

4. a. one-piece crank
b. three piece cotterless crank
c. three piece cottered crank

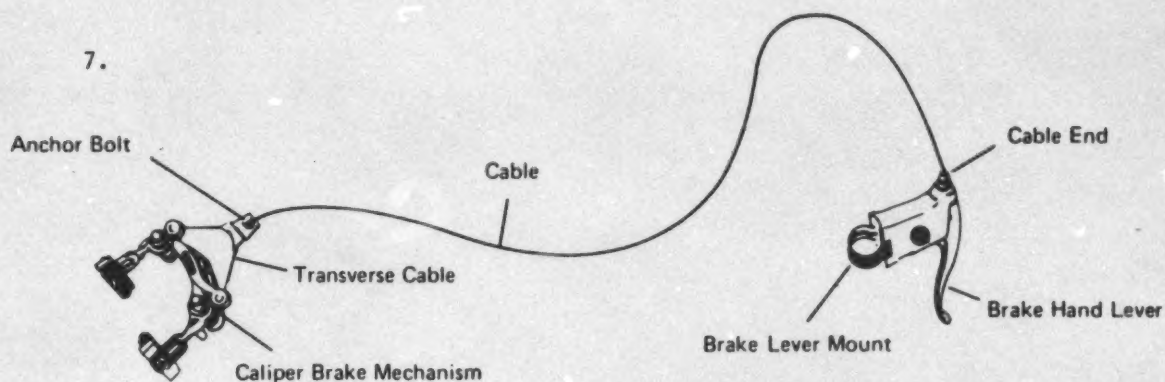
Brake System

5. caliper and coaster brakes

6. caliper brakes--found on multispeed bikes

coaster brakes--found usually on single speed bikes (some 3 and 5 speed bicycles have coaster brakes and caliper brakes)

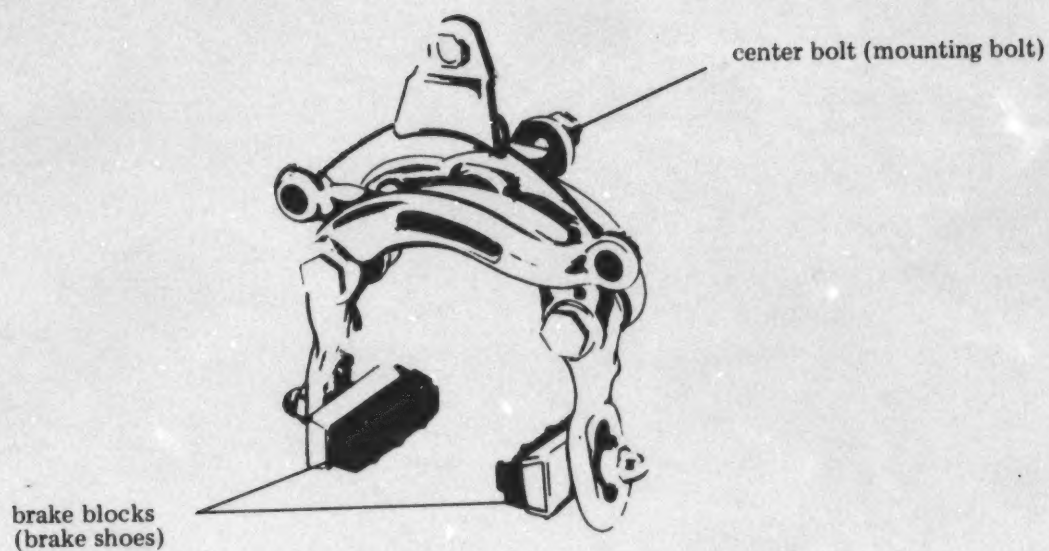
7.



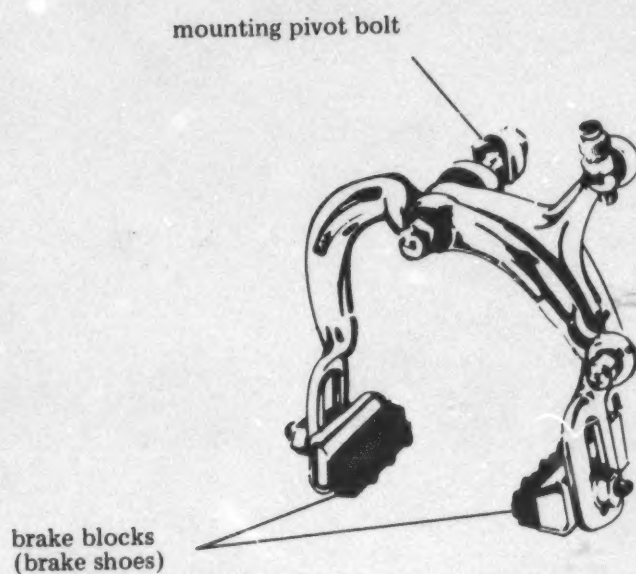
Caliper Braking System

8. The hand lever pulls the cable through the cable housing, which pinches together the arms of the caliper brake, that forces the brake blocks against the wheel rim to stop the wheel of the bicycle.
9. Brake blocks (also called brake shoes) are usually hard, somewhat abrasive materials which are attached to the brake arms.
10. The spring in the brake arm pulls the brake blocks away from the rims.
11. To make fine adjustments on the brake shoe's contact with the wheel rim.

12.



a. Center Pull Caliper Brake



b. Side Pull Caliper Brake

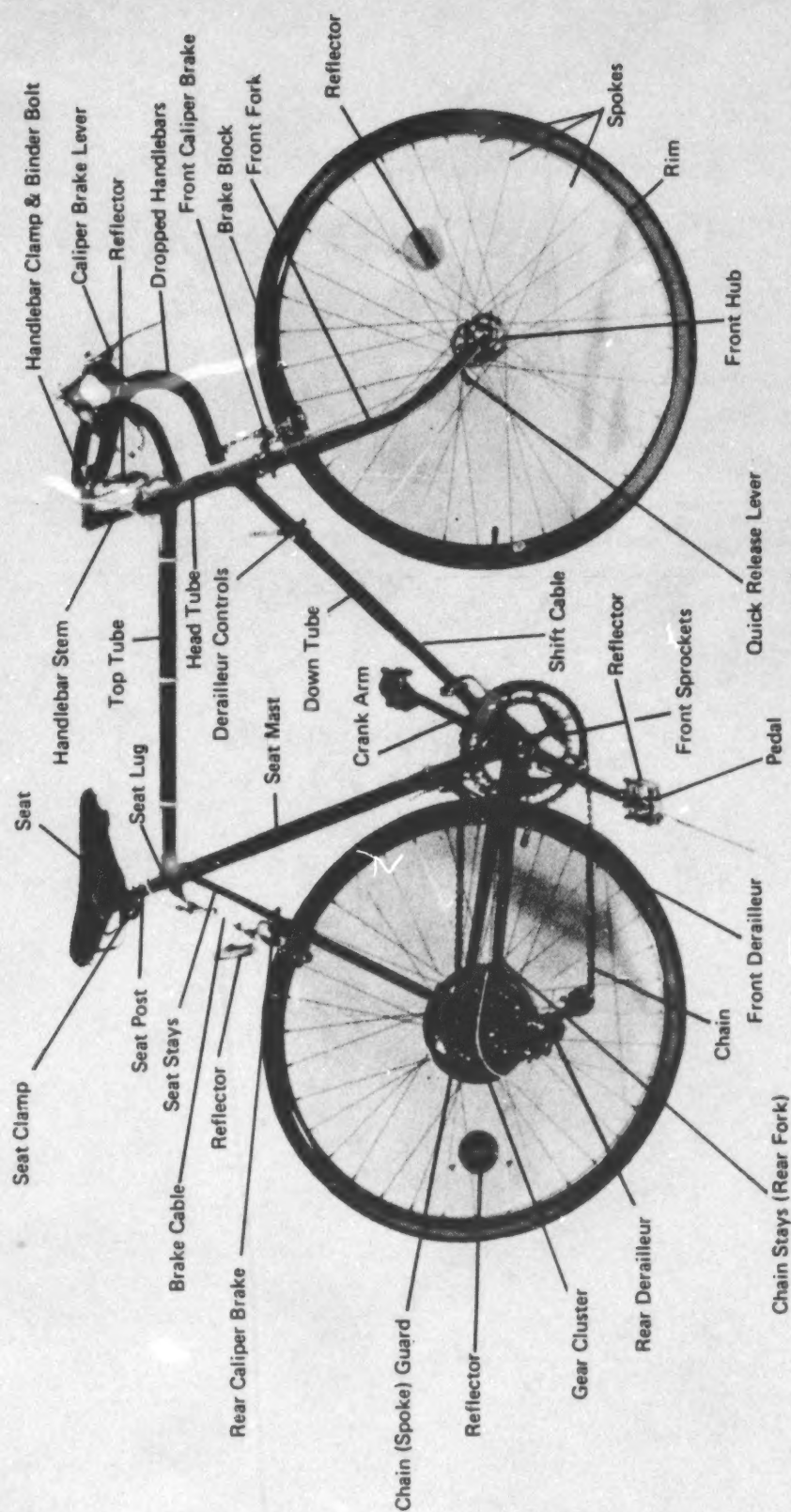
13. It holds one half of the coaster brake mechanism stationary.

14. By back pedaling.

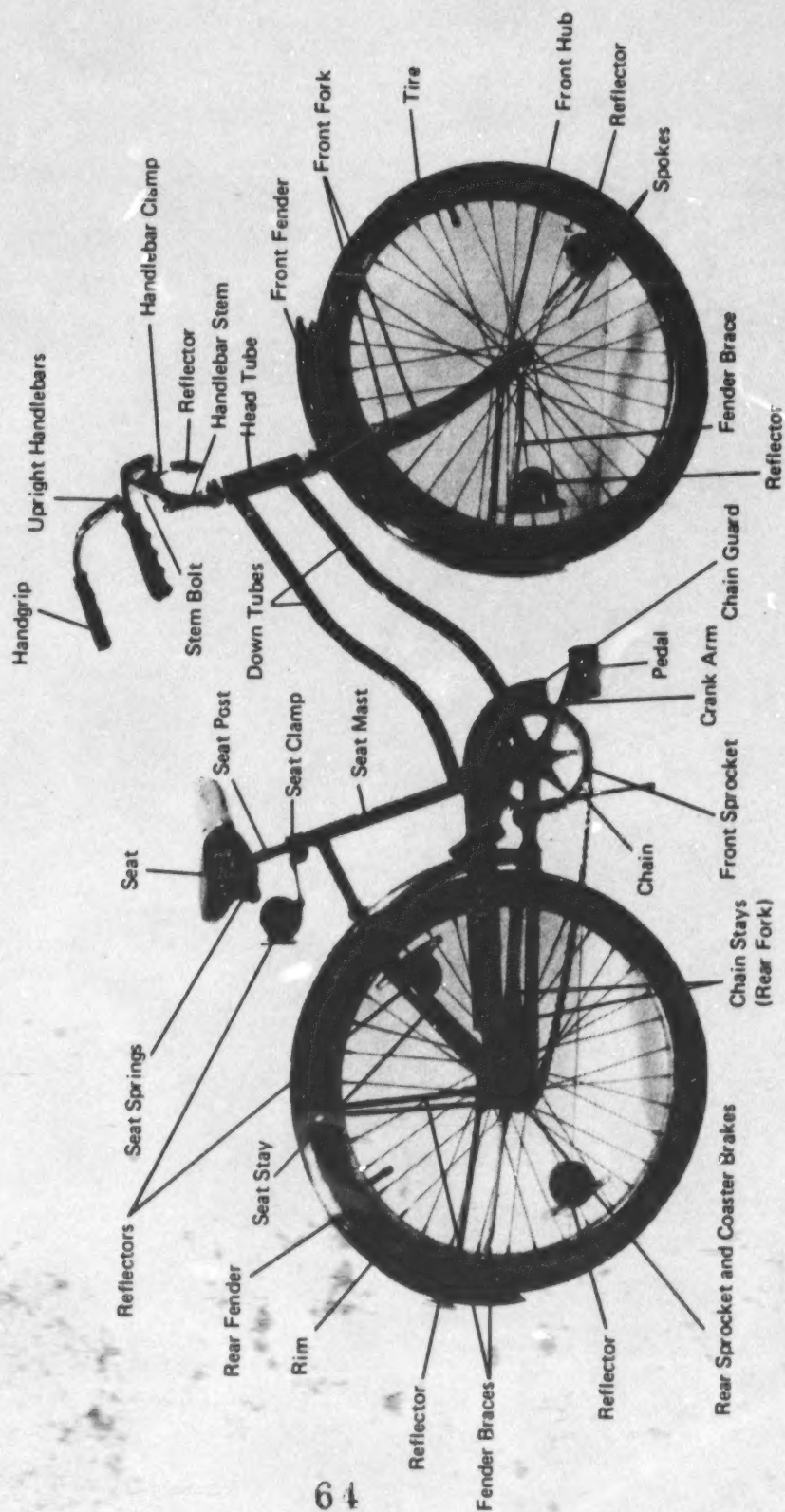
APPENDIX A
BICYCLE ILLUSTRATIONS

The following illustrations are representative of typical bicycles and bicycle parts used in the United States. Combinations of various elements of these bicycles can be made, i.e., coaster brakes or caliper brakes, various types of sprockets, frames, cranks, etc.

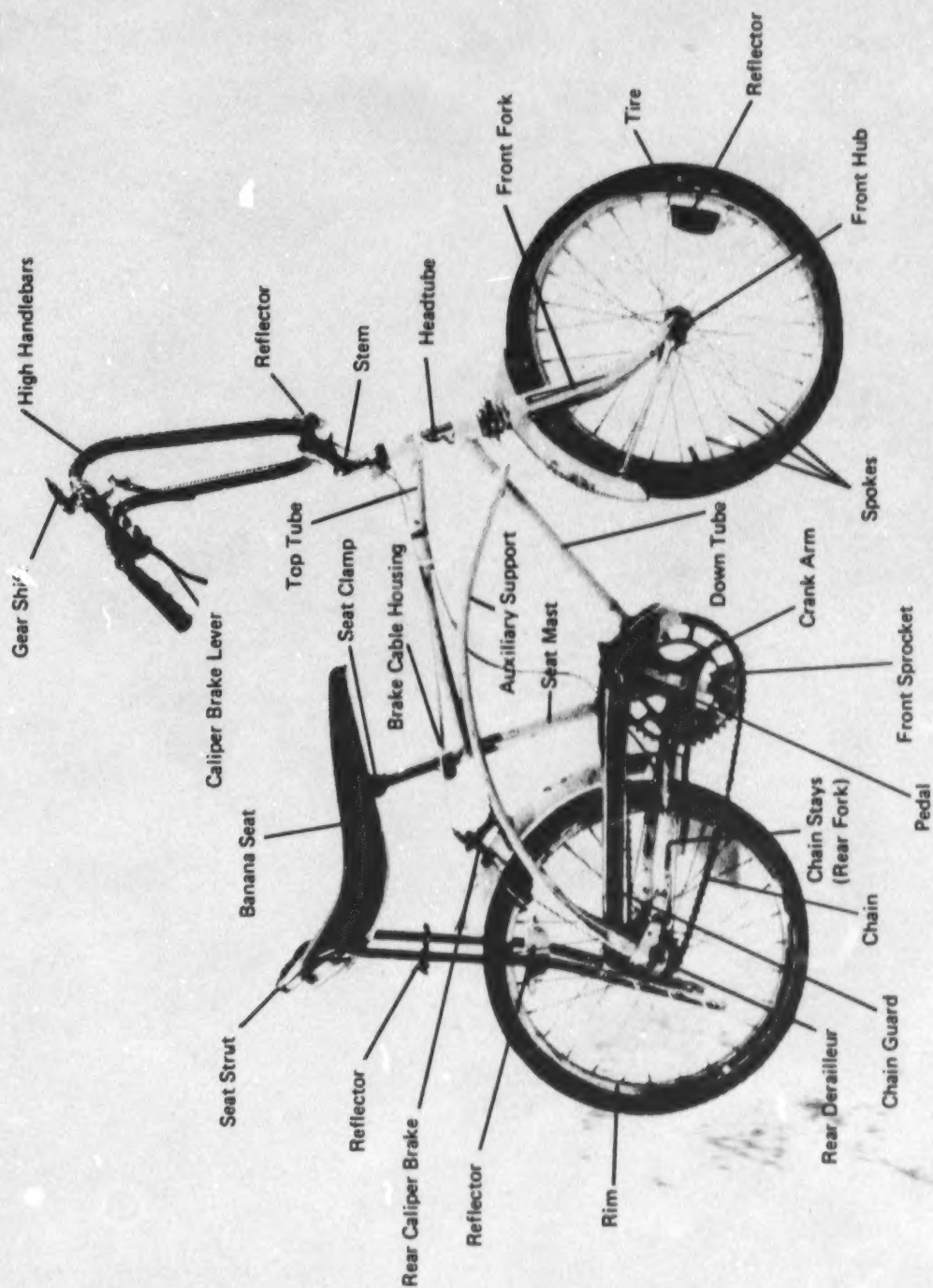
These illustrations may be removed for use as ready references.



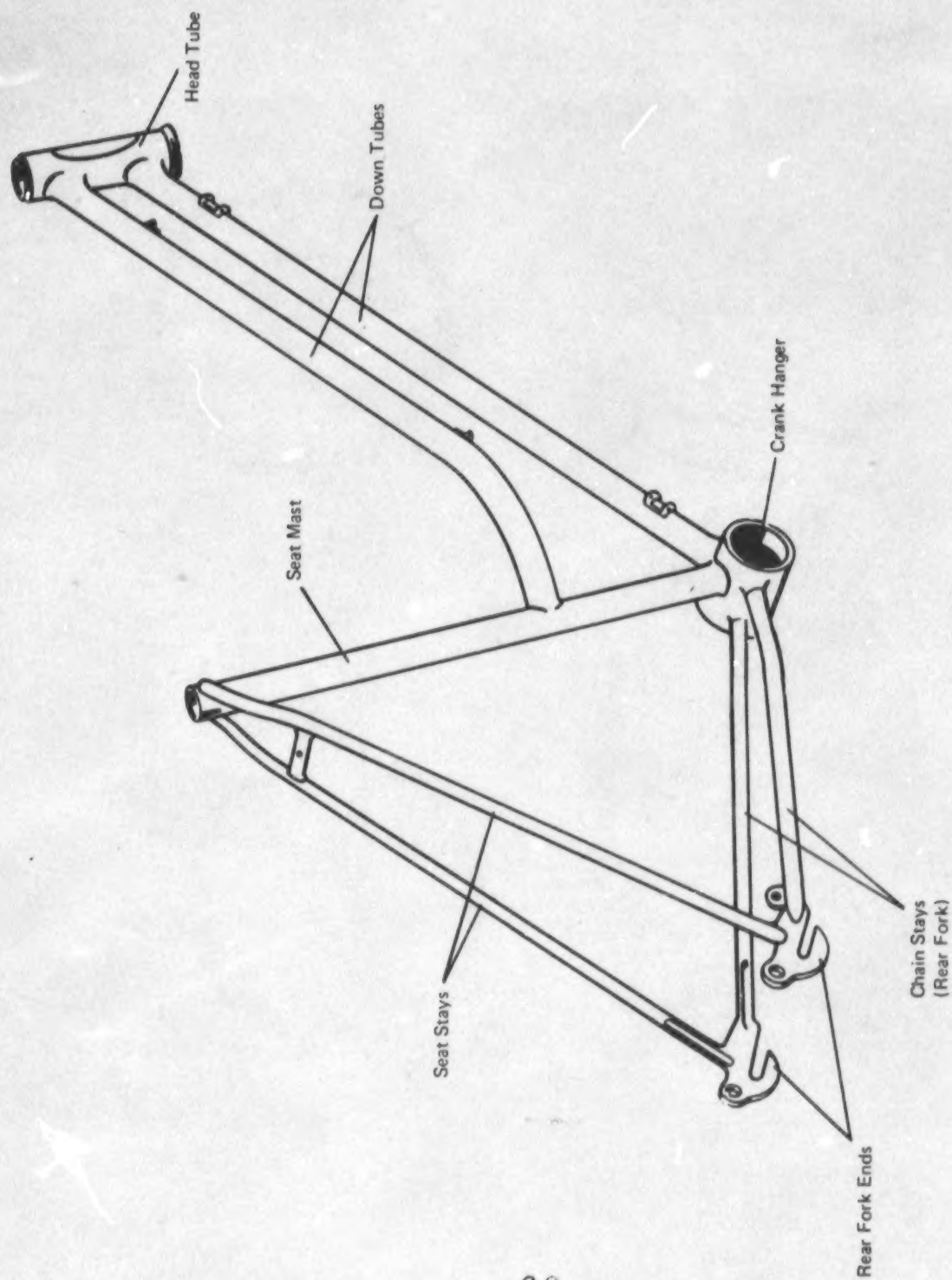
Lightweight Bicycle (usually 5-Speed or 10-Speed)



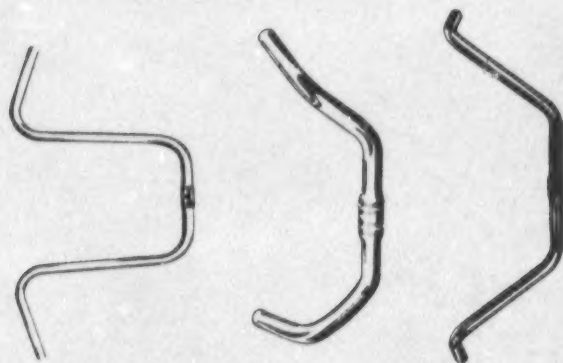
Middleweight Bicycle



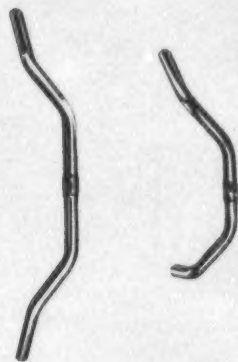
Highrise Bicycle



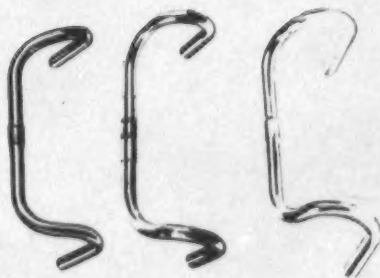
Female Model Frame



Upright Handlebars

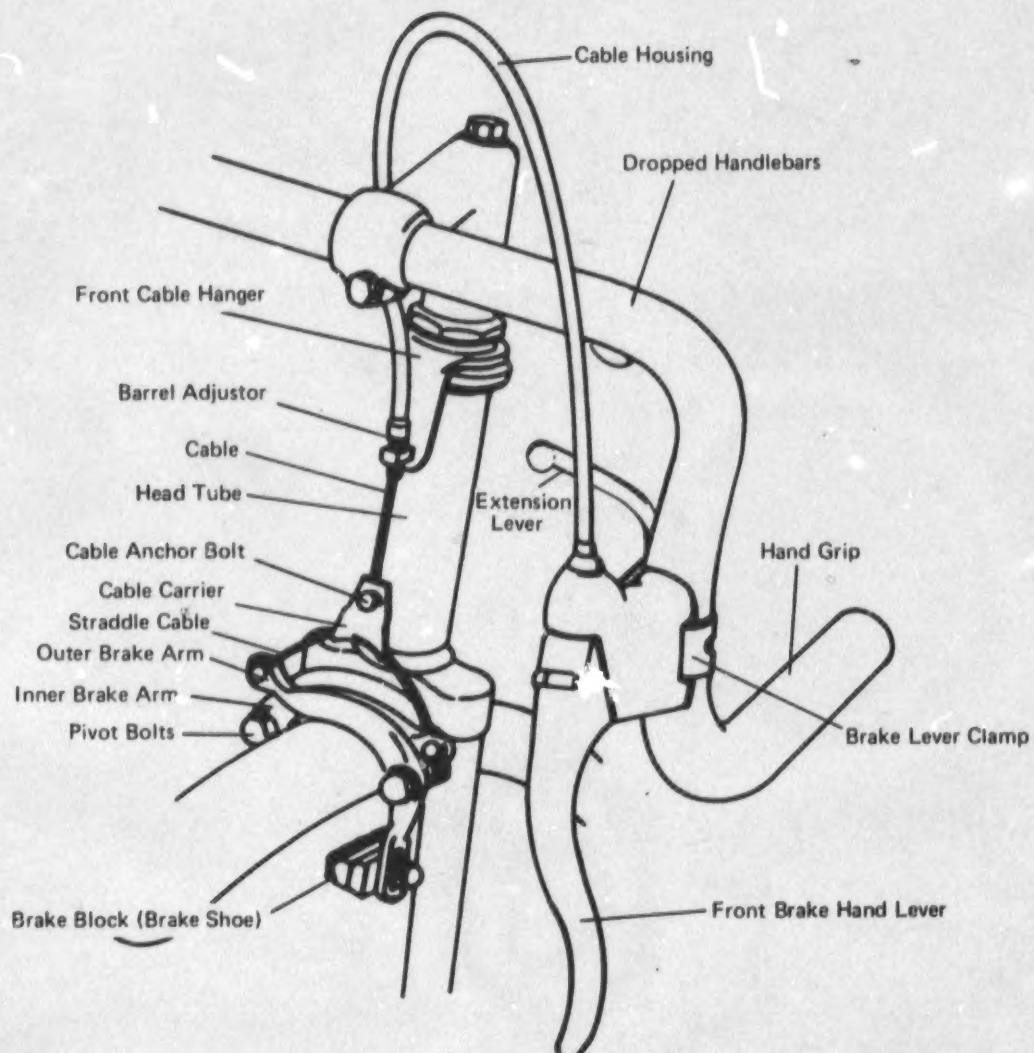


Flat Handlebars



Dropped Handlebars

Handlebar Styles



Center Pull Caliper Brake as Positioned on a Lightweight Bicycle

APPENDIX B
GLOSSARY OF BICYCLE TERMS

Glossary of Bicycle Terms

axle: the threaded rod, located inside the hub, on which the wheel rotates.

barrel adjustor: an adjusting screw, located between the handlebar stem and the front caliper brake unit, that changes the relationship of the cable housing length to the length of the brake cable.

brake arms: the arms or yokes of the caliper brake mechanism.

brake cable: a cable that passes through the cable housing, and is attached to the front or rear brake hand lever at one end, and the caliper brake mechanism at the other end.

brake hand levers: levers mounted on the handlebars to actuate the front and rear caliper brakes.

brake lever clamp: a device that clamps the brake hand levers to the handlebars.

brake shoe: (sometimes referred to as a brake block or brake pad) a piece of material attached to the inside of each of the brake shoe holders, used to transmit the braking force to the bicycle rim.

bicycle: a two-wheeled vehicle having a rear drive wheel that is solely human powered.

cable anchor bolt: a clamping device for holding the brake cable to the cable carrier.

cable hanger: a bracket for holding the brake cable barrel adjustor in place.

caliper brakes: hand actuated brake mechanism; when applied, the braking force is transferred to the bicycle rim through brake shoes. Usually found on multi-gear bicycles.

chain stays: the section of the frame from the crank hanger to the rear fork ends.

clincher tire: See wired-on tire.

coaster brakes: foot brakes, usually found on bicycles with a single front sprocket and a single rear sprocket.

control cable: a cable used to shift the bicycle into different speeds.

crank arm: a device, with pedals attached, located in the crank hanger, which transmits human power to the bicycle drive mechanism.

crank hanger: the part of the bicycle which holds the cranks in the frame and lets them spin freely.

crank set: that part of the bicycle consisting of the crank arms, spindle, drive sprocket and miscellaneous hardware.

derailleur: a speed changer, located at the front and/or rear of the bicycle which moves the chain from larger to smaller sprockets or vice versa, thus increasing or decreasing the gear ratio.

derailleur cage: a device that holds the rear derailleur idler and jockey wheels.

down tube: the part of the frame extending from the head tube to the crank hanger.

drive train system: a system primarily comprised of a chain, crank, pedals, and sprocket wheels used for transmitting human power to the rear wheel of the bicycle.

extension levers: See hand lever extensions.

fenders: the mud guards positioned over the back of the front wheel and the front of the back wheel.

fork ends: pieces that are attached to each seat stay, and the chain stays into which the rear wheel axle fits. In the front of the bicycle the fork ends are attached to each fork blade.

frame: the chief determinant of bicycle weight, made up of the seat post, the top tube, head tube, forks, front and rear fork end, down tube, crank hanger, chain stays, seat stays, and a seat mast.

freewheel: a device in the rear hub that permits the rear wheel to go on turning when the pedals are stopped.

front fork: the structure holding the front wheel fork ends, which is turned by the handlebars to steer the bicycle. Included in this unit is the handlebar stem (inside the head tube), fork blades, and fork ends.

handgrips: the part of the handlebar that is gripped to steer the bicycle.

handlebar stem: (sometimes referred to as a "gooseneck" or "extension") usually a steel piece, the top section of which holds the handlebars, while the bottom part is attached to the inside of the fork stem.

hand lever: a lever on the handlebars, that is used to apply the brakes.

hand lever extensions: auxilliary braking levers usually used on racing style bicycles with dropped handlebars.

head tube: the tube holding the front fork and fork bearings, into which the top and down tubes are attached.

high-rise bicycle: a bicycle characterized by a long "banana" seat, vertical seat strut, and high handlebars.

hub: the front or rear wheel part that has spokes attached to its outside and axles and bearings mounted inside. Rear hub may also contain a coaster brake.

idler roller: (sometimes called tension roller) the pulley or roller that idles loosely on the shaft pressing against the chain to guide it or take up slack.

jockey rollers: a small sprocket wheel used in the derailleur mechanism for applying tension to the chain.

lightweight bicycle: a bicycle characterized by 3, 5, or 10 gear speeds; usually has hub or derailleur gear shift mechanisms, and responds well in distance riding and sports.

lugs: the metal reinforcements used at the intersection of some frame members. A frame with lugs is a lugged frame.

middleweight bicycle: a bicycle characterized by single, two or three speeds, fenders, and coaster brakes.

non-pneumatic tires: tires not having a rubber inner tube, and which are made of solid or semi-solid material.

pneumatic tires: air-inflated tires that usually have a rubber inner tube (bicycles only).

quick release lever: a mechanism that permits quick removal of the front or rear wheels.

rear derailleur idler: a small sprocket wheel used in the derailleur mechanism for taking up chain slack.

rim: the wheel, less the spokes and the hub, on which the tire is mounted. The rim is the part of the bicycle to which the spokes are attached.

seat post: a tube or rod which is clamped to the seat mast.

seat stays: the rear part of the frame extending from the intersection of the top of the seat mast to the rear fork ends.

seat mast: the part of the frame in which the seat is placed and which extends from under the seat to the crank hanger.

spokes: the wires that are attached to the flanges of the hub at one end, and through the rim at the other end.

sprockets: (chainwheel) a wheel with gear teeth, used to drive the bicycle chain when pedaling.

toe clips: the cages or straps on the pedals that hold the rider's feet in position, often used in long-distance riding or racing.

top tube: the frame member between the seat tube and the head tube.

tubular tire: also known as the "sew-up" tire, incorporates the tire and tube into one unit, and is cemented to the rim.

wheel locking device: a locknut, nut and lockwasher; quick release lever; or other device used for locking the wheel to the bicycle frame.

wheels: are made up of an axle, a hub with bearings, spokes, spoke nipples, a rim strip, tire and a tube.

wired-on tire (clincher tire): a tire which has a strong wire bead at the base of the tire which rests closely against the rim inner surface. Some of these tires have no tubes and are used with either a straight-sided rim or a "hook bead" rim held in place with air pressure.

APPENDIX C
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